CLAIMS

1. A method for holographic recording and reproducing comprising a recording process and a reproducing process,

the recording process including the steps of:

generating a signal beam by spatially modulating a coherent reference beam in accordance with information to be recorded;

illuminating with the signal beam a recording medium made of a photosensitive material to allow the signal beam to pass through said recording medium; and

creating a diffraction grating area recorded by a light interference pattern in a portion where a 0th-order beam and a diffraction beam of the signal beam interfere with each other inside said recording medium; and

the reproducing process including the step of:

illuminating said diffraction grating area with said reference beam to generate a reproduced wave corresponding to the signal beam.

2. The method for holographic recording and reproducing according to claim 1, further comprising an incident-light-processing area provided in said recording medium on an opposite side of an entrance surface of the recording medium on which the signal beam is incident, the incident-light-processing area separating the 0th-order beam and the diffraction beam from each other to return a part of the incident beam to the inside of said recording medium.

3. The method for holographic recording and reproducing according to claim 2, further comprising a line-like track formed in a part of said incident-light-processing area.

4. The method for holographic recording and reproducing according to claim 3, wherein said track has positioning information of said incident-light-processing area with respect to said recording medium.

5. The method for holographic recording and reproducing according to claim 2, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area allowing the 0th-order beam to pass through or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and reflecting the diffraction beam.

6. The method for holographic recording and reproducing according to claim 2, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining

the 0th-order-beam-processing area and allowing the diffraction beam to pass through.

7. The method for holographic recording and reproducing according to claim 2, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or allowing the 0th-order beam to pass through, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and absorbing the diffraction beam.

8. The method for holographic recording and reproducing according to any one of claims 5 to 7, further comprising a spatial light modulator including a rows and columns matrix of pixels to spatially modulate the reference beam, wherein said spatial light modulator and said recording medium are relatively disposed in such a manner that said 0th-order-beam-processing area is not illuminated with the diffraction beam of the signal beam.

9. The method for holographic recording and reproducing according to claim 8, wherein said spatial light modulator and said recording medium are relatively disposed with respect to an optical axis of the signal beam in such a manner that an extending direction of a row or a column of said spatial light modulator makes a predetermined angle of θ ($\theta \neq 0$) with an extending

direction of said 0th-order-beam-processing area.

10. The method for holographic recording and reproducing according to claim 6, wherein the reproduced wave is output from the opposite side of the entrance surface of the recording medium on which the signal beam is incident, in the reproducing process.

11. A method for holographic recording comprising the steps of:

generating a signal beam by spatially modulating a coherent reference beam in accordance with information to be recorded;

illuminating with the signal beam a recording medium made of a photosensitive material to allow the signal beam to pass through said recording medium; and

creating a diffraction grating area recorded by a light interference pattern in a portion where a 0th-order beam and a diffraction beam of the signal beam interfere with each other inside said recording medium.

12. The method for recording a hologram according to claim 11, further comprising an incident-light-processing area provided in said recording medium on an opposite side of an entrance surface of the recording medium on which the signal beam is incident, the incident-light-processing area separating the 0th-order beam and the diffraction beam from each other to return a part of the incident beam to the inside of said recording medium.

13. The method for recording a hologram according to claim 12, further comprising a line-like track formed in a part of said incident-light-processing area.

14. The method for recording a hologram according to claim 13, wherein said track has positioning information of said incident-light-processing area with respect to said recording medium.

15. The method for recording a hologram according to claim 12, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area allowing the 0th-order beam to pass through or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and reflecting the diffraction beam.

16. The method for recording a hologram according to claim 12, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and allowing the diffraction beam to pass through.

17. The method for recording a hologram according to claim 12, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or allowing the 0th-order beam to pass through, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and absorbing the diffraction beam.

18. The method for recording a hologram according to any one of claims 15 to 17, further comprising a spatial light modulator including a rows and columns matrix of pixels to spatially modulate the reference beam, wherein said spatial light modulator and said recording medium are relatively disposed in such a manner that said 0th-order-beam-processing area is not illuminated with the diffraction beam of the signal beam.

19. The method for recording a hologram according to claim 18, wherein said spatial light modulator and said recording medium are relatively disposed with respect to an optical axis of the signal beam in such a manner that an extending direction of a row or a column of said spatial light modulator makes a predetermined angle of θ ($\theta \neq 0$) with an extending direction of said 0th-order-beam-processing area.

20. A method for holographic reproducing comprising the steps

of:

providing a recording medium made of a photosensitive material having a diffraction grating area formed through a recording process including the steps of: generating a signal beam by spatially modulating a coherent reference beam in accordance with information to be recorded; and illuminating with the signal beam the recording medium to allow the signal beam to pass through said recording medium so as to form the diffraction grating area recorded by a light interference pattern in a portion where a 0th-order beam and a diffraction beam of the signal beam interfere with each other inside said recording medium; and

illuminating a coherent reference beam to the diffraction grating area to generate a reproduced wave corresponding to the signal beam.

21. The method for reproducing a hologram according to claim 20, further comprising an incident-light-processing area provided in said recording medium on an opposite side of an entrance surface of the recording medium on which the signal beam is incident, the incident-light-processing area separating the 0th-order beam and the diffraction beam from each other to return a part of the incident beam to the inside of said recording medium.

22. The method for reproducing a hologram according to claim 21, further comprising a line-like track formed in a part of said incident-light-processing area.

23. The method for reproducing a hologram according to claim 22, wherein said track has positioning information of said incident-light-processing area with respect to said recording medium.

24. The method for reproducing a hologram according to claim 21, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area allowing the 0th-order beam to pass through or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and reflecting the diffraction beam.

25. The method for reproducing a hologram according to claim 21, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and allowing the diffraction beam to pass through.

26. The method for reproducing a hologram according to claim 21, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-

reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or allowing the 0th-order beam to pass through, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and absorbing the diffraction beam.

27. The method for reproducing a hologram according to any one of claims 24 to 26, wherein the diffraction grating area of the recording medium is recorded by using a spatial light modulator including a rows and columns matrix of pixels in such a manner that said spatial light modulator and said recording medium are relatively disposed so that said 0th-order-beam-processing area is not illuminated with the diffraction beam of the signal beam.

28. The method for reproducing a hologram according to claim 27, wherein said spatial light modulator and said recording medium are relatively disposed with respect to an optical axis of the signal beam in such a manner that an extending direction of a row or a column of said spatial light modulator makes a predetermined angle of θ ($\theta \neq 0$) with an extending direction of said 0th-order-beam-processing area.

29. The method for reproducing a hologram according to claim 25, wherein the reproduced wave is output from the opposite side of the entrance surface of the recording medium on which the signal beam is incident, in the reproducing process.

30. A holographic recording and reproducing apparatus for recording information as a diffraction grating area in a recording medium, and for reproducing said recorded information from said diffraction grating area, said holographic recording and reproducing apparatus comprising:

a holding section for detachably holding a recording medium made of a photosensitive material;

a light source for generating a coherent reference beam;

a signal beam generating unit including a spatial light modulator, said spatial light modulator spatially modulating said reference beam in accordance with said information to be recorded to generate a signal beam;

an interference unit including an illuminating optical system for illuminating the recording medium with the signal beam to allow it to enter into and pass through said recording medium, said illuminating optical system creating a diffraction grating area according to a light interference pattern in a portion where a 0th-order beam and a diffraction beam of the signal beam interfere with each other inside said recording medium, and said illuminating optical system illuminating said diffraction grating area with said reference beam to generate a reproduced wave corresponding to the signal beam; and

a detecting unit for detecting said recorded information formed into an image by the reproduced wave.

31. The holographic recording and reproducing apparatus

according to claim 30, further comprising an incident-light-processing area provided in said recording medium on an opposite side of an entrance surface of the recording medium on which the signal beam is incident, the incident-light-processing area separating the 0th-order beam and the diffraction beam from each other to return a part of the incident beam to the inside of said recording medium.

32. The holographic recording and reproducing apparatus according to claim 31, further comprising a line-like track formed in a part of said incident-light-processing area.

33. The holographic recording and reproducing apparatus according to claim 32, wherein said track has positioning information of said incident-light-processing area with respect to said recording medium.

34. The holographic recording and reproducing apparatus according to claim 31, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area allowing the 0th-order beam to pass through or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and reflecting the diffraction beam.

35. The holographic recording and reproducing apparatus according to claim 31, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and allowing the diffraction beam to pass through.

36. The holographic recording and reproducing apparatus according to claim 31, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or allowing the 0th-order beam to pass through, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and absorbing the diffraction beam.

37. The holographic recording and reproducing apparatus according to any one of claims 34 to 36, further comprising a spatial light modulator including a rows and columns matrix of pixels to spatially modulate the reference beam, wherein said spatial light modulator and said recording medium are relatively disposed in such a manner that said 0th-order-beam-processing area is not illuminated with the diffraction beam of the signal

beam.

38. The holographic recording and reproducing apparatus according to claim 37, wherein said spatial light modulator and said recording medium are relatively disposed with respect to an optical axis of the signal beam in such a manner that an extending direction of a row or a column of said spatial light modulator makes a predetermined angle of θ ($\theta \neq 0$) with an extending direction of said 0th-order-beam-processing area.

39. The holographic recording and reproducing apparatus according to claim 35, wherein the reproduced wave is output from the opposite side of the entrance surface of the recording medium on which the signal beam is incident.

40. The holographic recording and reproducing apparatus according to claim 34 or 36, further comprising a splitting unit separating the reproduced wave from an optical path of the reference beam.

41. A holographic recording apparatus for recording information as a diffraction grating area in a recording medium, comprising:

a holding section for detachably holding a recording medium made of a photosensitive material;

a light source for generating a coherent reference beam;

a signal beam generating unit including a spatial light

modulator, said spatial light modulator spatially modulating said reference beam in accordance with said information to be recorded to generate a signal beam; and

an interference unit including an illuminating optical system for illuminating the recording medium with the signal beam to allow it to enter into and pass through said recording medium, said illuminating optical system creating a diffraction grating area according to a light interference pattern in a portion where a 0th-order beam and a diffraction beam of the signal beam interfere with each other inside said recording medium.

42. The holographic recording apparatus according to claim 41, wherein the recording medium comprises an incident-light-processing area provided in said recording medium on an opposite side of an entrance surface of the recording medium on which the signal beam is incident, the incident-light-processing area separating the 0th-order beam and the diffraction beam from each other to return a part of the incident beam to the inside of said recording medium.

43. The holographic recording apparatus according to claim 42, further comprising a line-like track formed in a part of said incident-light-processing area.

44. The holographic recording apparatus according to claim 43, wherein said track has positioning information of said incident-light-processing area with respect to said recording

medium.

45. The holographic recording apparatus according to claim 42, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area allowing the 0th-order beam to pass through or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and reflecting the diffraction beam.

46. The holographic recording apparatus according to claim 42, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and allowing the diffraction beam to pass through.

47. The holographic recording apparatus according to claim 42, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or allowing the 0th-order beam to pass through,

the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and absorbing the diffraction beam.

48. The holographic recording apparatus according to any one of claims 45 to 47, further comprising a spatial light modulator including a rows and columns matrix of pixels to spatially modulate the reference beam, wherein said spatial light modulator and said recording medium are relatively disposed in such a manner that said 0th-order-beam-processing area is not illuminated with the diffraction beam of the signal beam.

49. The holographic recording apparatus according to claim 48, wherein said spatial light modulator and said recording medium are relatively disposed with respect to an optical axis of the signal beam in such a manner that an extending direction of a row or a column of said spatial light modulator makes a predetermined angle of θ ($\theta \neq 0$) with an extending direction of said 0th-order-beam-processing area.

50. A holographic reproducing apparatus for reproducing information recorded as a diffraction grating area in a recording medium, the reproducing apparatus comprising:

a holding section for detachably holding a recording medium made of a photosensitive material;

a light source for generating a coherent reference beam;

an illuminating unit including an illuminating optical system for illuminating the recording medium with the reference

beam to allow it to enter into and pass through the diffraction grating area in the recording medium to generate a reproduced wave corresponding to the signal beam; and

a detecting unit for detecting said recorded information formed into an image by the reproduced wave.

51. The holographic reproducing apparatus according to claim 50, wherein the recording medium comprises an incident-light-processing area provided in said recording medium on an opposite side of an entrance surface of the recording medium on which the signal beam is incident, the incident-light-processing area separating the 0th-order beam and the diffraction beam from each other to return a part of the incident beam to the inside of said recording medium.

52. The holographic reproducing apparatus according to claim 51, further comprising a line-like track formed in a part of said incident-light-processing area.

53. The holographic reproducing apparatus according to claim 52, wherein said track has positioning information of said incident-light-processing area with respect to said recording medium.

54. The holographic reproducing apparatus according to claim 51, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-

reflecting area, the 0th-order-beam-processing area allowing the 0th-order beam to pass through or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and reflecting the diffraction beam.

55. The holographic reproducing apparatus according to claim 51, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and allowing the diffraction beam to pass through.

56. The holographic reproducing apparatus according to claim 51, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or allowing the 0th-order beam to pass through, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and absorbing the diffraction beam.

57. The holographic reproducing apparatus according to any one of claims 54 to 56, wherein the diffraction grating area of

the recording medium is recorded by using a spatial light modulator including a rows and columns matrix of pixels in such a manner that said spatial light modulator and said recording medium are relatively disposed so that said 0th-order-beam-processing area is not illuminated with the diffraction beam of the signal beam.

58. The holographic reproducing apparatus according to claim 57, wherein said spatial light modulator and said recording medium are relatively disposed with respect to an optical axis of the signal beam in such a manner that an extending direction of a row or a column of said spatial light modulator makes a predetermined angle of θ ($\theta \neq 0$) with an extending direction of said 0th-order-beam-processing area.

59. The holographic reproducing apparatus according to claim 55, wherein the reproduced wave is output from the opposite side of the entrance surface of the recording medium on which the signal beam is incident.

60. The holographic reproducing apparatus according to claim 54 or 56, further comprising a splitting unit separating the reproduced wave from an optical path of the reference beam.

61. A recording medium made of a photosensitive material capable of being recorded by illumination with a coherent light beam, comprising an incident-light-processing area provided in

said recording medium on an opposite side of an entrance surface of the recording medium on which the light beam is incident, the incident-light-processing area separating a 0th-order beam and a diffraction beam of the light beam from each other to return a part of the incident beam to the inside of said recording medium.

62. The recording medium according to claim 61, further comprising a line-like track formed in a part of said incident-light-processing area.

63. The recording medium according to claim 62, wherein said track has positioning information of said incident-light-processing area with respect to said recording medium.

64. The recording medium according to claim 61, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area allowing the 0th-order beam to pass through or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and reflecting the diffraction beam.

65. The recording medium according to claim 61, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or

scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and allowing the diffraction beam to pass through.

66. The recording medium according to claim 61, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or allowing the 0th-order beam to pass through, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and absorbing the diffraction beam.

67. A holographic recording and reproducing apparatus for recording information as a diffraction grating area in a recording medium, and for reproducing said recorded information from said diffraction grating area, said holographic recording and reproducing apparatus comprising:

a holding section for detachably holding a recording medium made of a photosensitive material;

a light source for generating a coherent reference beam;

a signal beam generating unit including a spatial light modulator, said spatial light modulator spatially modulating said reference beam in accordance with said information to be recorded to generate a signal beam;

an interference unit including an illuminating optical

system for illuminating the recording medium with the signal beam to allow it to enter into and pass through said recording medium, said illuminating optical system creating a diffraction grating area according to a light interference pattern in a portion where a 0th-order beam and a diffraction beam of the signal beam interfere with each other inside said recording medium, and said illuminating optical system illuminating said diffraction grating area with said reference beam to generate a reproduced wave corresponding to the signal beam;

an incident-light-processing area provided adjacent to an opposite side of an entrance surface of the recording medium on which the signal beam is incident, the incident-light-processing area separating the 0th-order beam and the diffraction beam from each other to return a part of the incident beam to the inside of said recording medium; and

a detecting unit for detecting said recorded information formed into an image by the reproduced wave.

68. The holographic recording and reproducing apparatus according to claim 67, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area allowing the 0th-order beam to pass through or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and reflecting the diffraction beam.

69. The holographic recording and reproducing apparatus according to claim 67, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and allowing the diffraction beam to pass through.

70. The holographic recording and reproducing apparatus according to claim 67, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or allowing the 0th-order beam to pass through, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and absorbing the diffraction beam.

71. The holographic recording and reproducing apparatus according to claim 67, wherein said spatial light modulator includes a rows and columns matrix of pixels and wherein said spatial light modulator and said recording medium are relatively disposed with respect to an optical axis of the signal beam in such a manner that an extending direction of a row or a column

of said spatial light modulator makes a predetermined angle of θ ($\theta \neq 0$) with an extending direction of said 0th-order-beam-processing area.

72. The holographic recording and reproducing apparatus according to claim 69, wherein the reproduced wave is output from the opposite side of the entrance surface of the recording medium on which the signal beam is incident.

73. The holographic recording and reproducing apparatus according to claim 68 or 70, further comprising a splitting unit separating the reproduced wave from an optical path of the reference beam.

74. A holographic recording apparatus for recording information as a diffraction grating area in a recording medium, comprising:

a holding section for detachably holding a recording medium made of a photosensitive material;

a light source for generating a coherent reference beam;

a signal beam generating unit including a spatial light modulator, said spatial light modulator spatially modulating said reference beam in accordance with said information to be recorded to generate a signal beam;

an interference unit including an illuminating optical system for illuminating the recording medium with the signal beam to allow it to enter into and pass through said recording medium,

said illuminating optical system creating a diffraction grating area according to a light interference pattern in a portion where a 0th-order beam and a diffraction beam of the signal beam interfere with each other inside said recording medium; and

an incident-light-processing area provided adjacent to an opposite side of an entrance surface of the recording medium on which the signal beam is incident, the incident-light-processing area separating the 0th-order beam and the diffraction beam from each other to return a part of the incident beam to the inside of said recording medium.

75. The holographic recording apparatus according to claim 74, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area allowing the 0th-order beam to pass through or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and reflecting the diffraction beam.

76. The holographic recording apparatus according to claim 74, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-

beam-processing area and allowing the diffraction beam to pass through.

77. The holographic recording apparatus according to claim 74, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or allowing the 0th-order beam to pass through, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and absorbing the diffraction beam.

78. The holographic recording apparatus according to claim 74, wherein said spatial light modulator includes a rows and columns matrix of pixels and wherein said spatial light modulator and said recording medium are relatively disposed with respect to an optical axis of the signal beam in such a manner that an extending direction of a row or a column of said spatial light modulator makes a predetermined angle of θ ($\theta \neq 0$) with an extending direction of said 0th-order-beam-processing area.

79. A holographic reproducing apparatus for reproducing information recorded as a diffraction grating area in a recording medium, the reproducing apparatus comprising:

a holding section for detachably holding a recording medium made of a photosensitive material;

a light source for generating a coherent reference beam;

an illuminating unit including an illuminating optical system for illuminating the recording medium with the reference beam to allow it to enter into and pass through the diffraction grating area in the recording medium to generate a reproduced wave corresponding to the signal beam;

an incident-light-processing area provided adjacent to an opposite side of an entrance surface of the recording medium on which the signal beam is incident, the incident-light-processing area separating the 0th-order beam and the diffraction beam from each other to return a part of the incident beam to the inside of said recording medium; and

a detecting unit for detecting said recorded information formed into an image by the reproduced wave.

80. The holographic reproducing apparatus according to claim 79, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area allowing the 0th-order beam to pass through or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and reflecting the diffraction beam.

81. The holographic reproducing apparatus according to claim 79, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting

the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or absorbing the 0th-order beam, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and allowing the diffraction beam to pass through.

82. The holographic reproducing apparatus according to claim 79, wherein said incident-light-processing area comprises a 0th-order-beam-processing area and a diffraction-beam-reflecting area, the 0th-order-beam-processing area reflecting the 0th-order beam or scattering the 0th-order beam or deflecting the 0th-order beam or allowing the 0th-order beam to pass through, the diffraction-beam-reflecting area defining the 0th-order-beam-processing area and absorbing the diffraction beam.

83. The holographic reproducing apparatus according to any one of claims 80 to 82, wherein the diffraction grating area of the recording medium is recorded by using a spatial light modulator including a rows and columns matrix of pixels in such a manner that said spatial light modulator and said recording medium are relatively disposed so that said 0th-order-beam-processing area is not illuminated with the diffraction beam of the signal beam.

84. The holographic reproducing apparatus according to claim 83, wherein said spatial light modulator and said recording medium are relatively disposed with respect to an optical axis

of the signal beam in such a manner that an extending direction of a row or a column of said spatial light modulator makes a predetermined angle of θ ($\theta \neq 0$) with an extending direction of said 0th-order-beam-processing area.

85. The holographic reproducing apparatus according to claim 81, wherein the reproduced wave is output from the opposite side of the entrance surface of the recording medium on which the signal beam is incident, in the reproducing process.

86. The holographic reproducing apparatus according to claim 80 or 82, further comprising a splitting unit separating the reproduced wave from an optical path of the reference beam.